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Finding, Cutting, Wire-wrapping the NPG Jumper on the UNIBUS Backplane of the VAX 11/780

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I. Background of UNIBUS function
   A. H/W developers primary interface to VAX 11/780
   B. Types of devices that connect to UNIBUS
   C. Asynchronous bi-directional bus
   D. Function
      1. Prioritize arbitration among devices
      2. High speed communication path
      3. Links I/O devices to UNIBUS adapter (UBA)
      4. Handles all communication between UBA AND Synchronous Backplane Interface (SBI)
      5. Detects device generated interrupts

II. Interrupts
   A. UNIBUS sources of SBI interrupts
      1. The UNIBUS device
      2. The UNIBUS adapter
   B. UNIBUS interrupt request levels
      1. Determined by the UNIBUS Bus Request (BR) lines
      2. Interrupts from UBA occur at one assigned request level set by a backplane jumper

III. Bus Request levels
   A. Device request levels for requesting bus control
      1. Non-processor Requests (NPR)
      2. Four BR levels BR7 BR6 BR5 BR4
   B. Define NPR/NPG
      1. NPR- bus request from a device for a transfer not requiring CPU INTERVENTION (Direct Memory Access (DMA))
      2. NPG- Grant signal in response to NPR
   C. NPR used when device requests a direct access data transfer to memory or another device
   D. Bus lines associated with NPR priority level
      1. Two lines - Request issued on NPR
                     Grant issued on NPG
      2. NPR has highest priority

IV. UNIBUS operation
   A. UNIBUS NPR device memory transfers are completed by placing addresses in lower range on bus
   B. UNIBUS device initiates request by asserting NPR
   C. If memory not locked (CPU accessing memory), arbitrator asserts NPG to requesting device

V. Communications and Control
   A. Master/Slave relationship between devices on UNIBUS
   B. Master- Device in control/Slave- Device being addressed

VI. Device examples
   A. DR11-W in DMA mode becomes master via NPR request & operates directly on memory
   B. DZ-11 is interrupt driven. DZ initiates interrupt, Interrupt service routine interprets & services interrupts

VII. Identify/Replace/Remove NPG wire
   A. Explain DEC alphabet
      1. A B C D E F H J K L M N P R S T U V
      2. Describe pinout on backplane
   B. Locate UNIBUS BA11-K
      1. Locate System units (SU)
      2. Describe Grant continuity modules (flip chips)
      3. Power switch
   C. Warning against hair, badges, pens, calculators etc.
   D. Locating CA1-CB1 pins on backplane
   E. Tools/materials required
      1. Wire wrap manual/electric
      2. Unwrap tool
      3. Wire AWG #30

VIII. Summary
   A. Overview of NPR/NPG signal
   B. Locating CA1-CB1
   C. Warnings